ESA Section 7 Consultation No: 2002/01939

National Marine Fisheries Service
Endangered Species Act Section 7 Consultation
and Magnuson-Stevens Act
Essential Fish Habitat Consultation

Action Agencies:
The National Marine Fisheries Service (NMFS)
The Bonneville Power Administration (BPA)
The Bureau of Indian Affairs (BIA)
The Bureau of Land Management (BLM)
The U.S. Army Corp of Engineers (COE)
The U.S. Environmental Protection Agency (EPA)
The U.S. Fish and Wildlife Service (USFWS)
The U.S. Forest Service (USFS)
The U.S. National Park Service (NPS)

Species/ESUs:
Oregon Coast (OC) coho salmon *(Oncorhynchus kisutch)*
Southern Oregon/Northern California Coasts (SONCC) coho salmon

Essential Fish Habitat Affected:
Pacific salmon, groundfish, and coastal pelagic species

Actions:
1. Issuance of Permit No. 1140 to the NMFS' Northwest Fisheries Science Center (NWFSC).
2. Issuance of Permit No. 1205 to the Oregon Department of Environmental Quality (ODEQ).
3. Issuance of Permit No. 1335 to the USFS.
4. Issuance of Permit No. 1410 to the NWFSC.

Consultation Conducted By: Protected Resources Division (PRD), Northwest Region, NMFS
Consultation Number 2002/01939

Approved By: ~~for~~ D. Robert Lohn, Regional Administrator

Date: June 13, 2003 (Expires on: December 31, 2007)

This biological opinion (Opinion) constitutes NMFS' review of four Endangered Species Act (ESA) section 10(a)(1)(A) permit actions. It has been prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). It is based on information provided in the applications for the proposed permits and permit modification, comments from reviewers including NMFS' Northwest Fisheries Science Center, published and unpublished scientific information on the biology and ecology of threatened salmonids in the action area, and other sources of information. A complete administrative record of these consultations is on file with the PRD in Portland, Oregon.

NMFS concludes that the proposed ESA section 10(a)(1)(A) actions discussed in this consultation are not likely to jeopardize the continued existence of threatened Oregon Coast coho salmon or threatened Southern Oregon/Northern California Coasts coho salmon or result in the destruction or adverse modification of the species' designated critical habitat. Further, the actions are not likely to adversely affect any designated essential fish habitat.

CONSULTATION HISTORY

NMFS proposes to issue three permits and one permit modification and thereby authorize the permit holders to conduct scientific research on listed OC coho salmon and SONCC coho salmon. The Northwest Region's PRD decided to group these actions in a single consultation pursuant to 50 CFR 402.14(c) because they are similar in nature and duration and will affect the same listed species. Though some of the proposed permit actions may affect other species as well, this Opinion constitutes formal consultation and an analysis of effects solely for OC coho salmon and SONCC coho salmon.

The first of the permit requests was received in December of 2002. Some of the requests were deemed incomplete when they arrived at the PRD. After numerous phone calls and e-mails, each of the applications was determined to be complete and then notice was published in the *Federal Register* asking for public comment. The public was given 30 days on each application, and once that period closed, the consultation began. The full consultation histories for all ten actions are lengthy and are not directly relevant to the analysis for the proposed actions so they will not be detailed here. Nonetheless, the PRD in Portland, Oregon maintains the complete histories for each proposed action in the administrative record for this consultation and for each permit.

DESCRIPTION OF THE PROPOSED ACTIONS

Common Elements Among the Proposed Actions

NMFS proposes to issue three permits and one permit modification and thereby authorize the permit holders to conduct scientific research involving threatened OC coho salmon and threatened SONCC coho salmon. Although some of these actions may affect listed species other than those listed above, this Opinion constitutes formal consultation and an analysis of effects solely for the Evolutionarily Significant Units (ESUs) that are the subject of this consultation. The effects of taking other species are described in other biological opinions and are not relevant to this consultation. Therefore only those portions of the proposed research activities that would affect OC coho salmon and SONCC coho salmon are discussed here.

It should be noted that some of the activities identified in the proposed permit actions would be funded by Federal agencies listed above. Although these agencies are responsible for complying with section 7 of the ESA because they are funding activities that may affect listed species, this consultation examines the actual actions they propose to fund and thus fulfills their section 7 consultation obligations.

All three new permit actions considered in this Opinion would be in effect for up to five years (i.e., through 2007). The permit modification action considered in this Opinion is expected to be in effect for the duration of the permit which expires December 31, 2006.

As part of any proposed action to issue research permits, NMFS lays out the terms and conditions to be followed before, during, and after the research activities are conducted. These conditions are intended to: (a) manage the interaction between scientists and listed salmonids by requiring that research activities be coordinated among permit holders and between permit holders and NMFS, (b) require measures to minimize impacts on listed species, (c) ensure compliance with the ESA, and (d) ensure that NMFS receives information about the effects the permitted activities have on the species concerned. All permits NMFS issues would have the following conditions. That is, in all cases:

1. The permit holder must ensure that listed species are taken only at the levels, by the means, in the areas and for the purposes stated in the permit application, and according to the terms and conditions in this permit.

2. The permit holder must not intentionally kill or cause to be killed any listed species unless the permit specifically allows intentional lethal take.

3. The permit holder must handle listed fish with extreme care and keep them in cold water to the maximum extent possible during sampling and processing procedures. When fish are transferred or held, a healthy environment must be provided; e.g., the holding units must contain adequate amounts of well-circulated water. When using gear that captures a mix of species, the permit holder must process listed fish first to minimize handling stress.

4. The permit holder must stop handling listed juvenile fish if the water temperature exceeds 70 degrees Fahrenheit at the capture site. Under these conditions, listed fish may only be visually identified and counted.

5. If the permit holder anesthetizes listed fish to avoid injuring or killing them during handling, the fish must be allowed to recover before being released. Fish that are only counted must remain in water and not be anesthetized.

6. The permit holder must use a sterilized needle for each individual injection when passive integrated transponder tags (PIT-tags) are inserted into listed fish.

7. If the permit holder incidentally captures any listed adult fish while sampling for juveniles, the adult fish must be released without further handling and such take must be reported.

8. The permit holder must exercise care during spawning ground surveys to avoid disturbing listed adult salmonids when they are spawning. Researchers must avoid walking in salmon streams whenever possible, especially where listed salmonids are likely to spawn. Visual observation must be used instead of intrusive sampling methods, especially when just determining presence of anadromous fish.

9. The permit holder using backpack electrofishing equipment must comply with NMFS' Backpack Electrofishing Guidelines (June 2000) available at http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/final4d/electro2000.pdf.

10. The permit holder must obtain approval from NMFS before changing sampling locations or research protocols.

11. The permit holder must notify NMFS as soon as possible but no later than 2 days after any authorized level of take is exceeded or if such an event is likely. The permit holder must submit a written report detailing why the authorized take level was exceeded or is likely to be exceeded.

12. The permit holder is responsible for any biological samples collected from listed species as long as they are used for research purposes. The permit holder may not transfer biological samples to anyone not listed in the application without prior written approval from NMFS.

13. The person(s) actually doing the research must have a copy of this permit while conducting the authorized activities.

14. The permit holder must allow any NMFS employee or representative to accompany field personnel while they conduct the research activities.

15. The permit holder must allow any NMFS employee or representative to inspect any records or facilities related to the permit activities.

16. The permit holder may not transfer or assign this permit to any other person as defined in Section 3(12) of the ESA. This permit ceases to be in effect if transferred or assigned to any other person without NMFS' authorization.

17. NMFS may amend the provisions of this permit after giving the permit holder reasonable notice of the amendment.

18. The permit holder must obtain all other Federal, state, and local permits/authorizations needed for the research activities.

19. On or before January 31th of every year, the permit holder must submit to NMFS a post-season report in the prescribed form describing the research activities, the number of listed fish taken and the location, the type of take, the number of fish intentionally killed and unintentionally killed, the take dates, and a brief summary of the research results. Falsifying annual reports or permit records is a violation of this permit.

20. If the permit holder violates any permit term or condition they will be subject to any and all penalties provided by the ESA. NMFS may revoke this permit if the authorized activities are not

conducted in compliance with the permit and the requirements of the ESA or if NMFS determines that its ESA section 10(d) findings are no longer valid.

Additional permit conditions specific to the proposed research may be included in certain permits.

Finally, NMFS will monitor actual annual take of listed fish species associated with scientific research activities, by requiring annual reports or by other means, and shall adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels are determined to operate to the disadvantage of the listed species.

The Individual Permits

Table 1 displays the overall amounts of take requested in each permit application, the general actions with which that take would be associated, and general location of research activities. "Take" is defined in section 3 of the ESA; it means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or to attempt to engage in any such conduct. The table's purpose is to depict the total impact—strictly in terms of pure take numbers—that can be expected from the proposed research activities. Detailed, action-by-action breakdowns (i.e., how much take is associated with each activity in each permit) are found in the Effects of the Action section.

Table 1. Summary of the proposed research permits considered in this Opinion.

Permit No.	OC coho	SONCC coho	Proposed Actions	Locations
1140	400 juvenile intentional morts		Intentional mortality	Yaquina and Alsea Bays, Salmon and Columbia Rivers
1205		1080 juvenile handle, 54 juvenile unintentional morts	Capture/handle/release	Randomly selected sites in the SONCC coho ESU
1335 mod 2	500 juvenile handle, 10 unintentional morts	500 juvenile handle, 15 juvenile unintentional morts	Capture/handle/release	Stream systems in the Columbia and Oregon Coast basins
1410	40 adult handle, 1 adult unintentional mort, 150 juvenile intentional morts	4 adult handle, 15 juvenile intentional morts	Capture/handle/release; Intentional mortality	Columbia River plume and surrounding ocean environment

Juv = juvenile, mort = mortality. Unintentional mortality represents fish that are killed by accident when the research is conducted. Intentional mortality represents fish that are killed on purpose as part of the research.

Permit 1140—NWFSC

Permit 1140 would authorize the NWFSC to conduct studies that would annually take juvenile threatened OC coho salmon during the course of research activities in nearshore areas in Oregon and Washington. The purpose of the research is to assess the relationship between environmental variables, selected anthropogenic stresses, and bacterial and parasitic pathogens on disease-induced mortality in juvenile salmon. The NWFSC would collect information to: (1) determine contaminant concentrations in fish, (2) understand bioaccumulation in juvenile salmon and determine site-specific factors, (3) analyze for the presence of physiological biomarkers, and (4) investigate the presence of indicators of exposure to environmental estrogens. The NWFSC proposes to collect samples with seines or high speed rope trawls and requests authorization to intentionally kill salmon for pathogen prevalence and intensity, biochemical composition, histopathological attributes, and stomach content analyses.

In addition to all other conditions, the following Special Condition will be included in Permit 1140:

- If any listed juvenile fish are unintentionally killed during these activities they must be used in place of intentional mortalities.

Permit 1205—ODEQ

Permit 1205 would authorize the ODEQ to conduct research that would take juvenile threatened SONCC coho salmon during the course of research activities in randomly selected streams in Southwestern Oregon. The research involves stream vertebrate surveys that are part of a monitoring program that evaluates the chemical, biological, and habitat conditions of streams on a regional basis. ODEQ's research implements the Oregon Plan and is coordinated with the Oregon Department of Fish and Wildlife and the EPA. ODEQ would capture listed juvenile salmon using backpack electrofishing, sample them for biological information, and release them. The research will benefit the listed species by providing baseline information to support enforcement of the Clean Water Act in freshwater river systems where listed fish are present.

Permit 1335 Modification 2—USFS

Modification 2 to Permit 1335 would authorize the USFS to take juvenile threatened OC coho salmon and juvenile threatened SONCC coho salmon while conducting research in selected stream systems in the Columbia and Oregon Coast basins. The USFS proposes to capture, handle, and release listed salmonids and while most of the fish would be unharmed, some may die as an indirect result of the research. Backpack electrofishing would be used to capture the fish. Captured fish would be anesthetized, identified, and measured. The purposes of the research are to assess watershed conditions and factors limiting salmonid health and reproduction, and evaluate watershed health under the Northwest Forest Plan. The activities will

benefit listed fish by generating information to improve forest management.

Permit 1410—NWFSC

Permit 1410 would authorize the NWFSC to conduct studies that would annually take adult and juvenile threatened OC coho salmon and adult and juvenile threatened SONCC coho salmon during the course of research activities in the Columbia River plume and surrounding ocean environment. The purpose of the research is to assess factors controlling estuarine and marine survival. The NWFSC would collect information to help predict and forecast survival potential as a function of easily measured indices of plume and ocean conditions. Further, the information would help hydropower operators develop a set of management scenarios that could benefit survival, growth, and health of juvenile salmon by changing the dynamics of the Columbia River plume. The NWFSC proposes to collect fish with purse seines and trawl nets, sample them for biological data, and release them and requests authorization to intentionally kill juvenile salmon for endocrine assessments, genetic stock identification, pathogen prevalence and intensity, otolith and stomach content analyses, and histopathological attributes. A few additional fish may die as an indirect result of the research.

In addition to all other conditions, the following Special Condition will be included in Permit 1410:

- If any listed juvenile fish are unintentionally killed during these activities they must be used in place of intentional mortalities.

The Action Area

The proposed actions considered in this Opinion may affect two threatened species: OC coho salmon and SONCC coho salmon—including the species' habitat. For SONCC coho, this includes the species' designated critical habitat. The action area is defined as the geographic extent of all direct and indirect effects of a proposed agency action [50 C.F.R. 402.02 and 402.14(h)(2)]. The action area for this consultation includes all marine, estuarine, and river reaches accessible to listed coho salmon in the OC and SONCC subbasins in Oregon. Researchers will conduct their activities throughout this area. The actions have the potential to affect the water, substrate, and adjacent riparian zones of estuarine and accessible riverine reaches in several hydrologic units and counties. Accessible reaches are those within the historical range of the ESUs that can still be occupied by any life stage of salmon. More detailed habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for these ESUs can be found in the February 16, 2000, *Federal Register* notice designating critical habitat (65 FR 7764) (NMFS, 2000a). The critical habitat designation for OC coho salmon was vacated and remanded to NMFS for new rulemaking pursuant to a court order in May of 2002. In the absence of a new rule designating critical

habitat, this consultation will evaluate the effects of the proposed actions on the species' habitat to determine whether those actions are likely to jeopardize the species' continued existence.

OC coho salmon
For the purposes of this Opinion, the action area includes all Oregon coastal river basins known to support this ESU from Cape Blanco north to the Columbia River. This habitat includes all river reaches and estuarine areas accessible to listed OC coho salmon from coastal streams south of the Columbia River and north of Cape Blanco, Oregon. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Clatsop, Tillamook, Washington, Columbia, Yamhill, Benton, Lincoln, Polk, Lane, Douglas, Coos, Josephine, and Curry.

SONCC coho salmon
For the purposes of this Opinion, the action area includes Oregon coastal river basins known to support this ESU south of Cape Blanco to the Oregon-California border. Critical habitat is designated to include all river reaches and estuarine areas accessible to listed SONCC coho salmon between Cape Blanco, Oregon to Punta Gorda, California. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Klamath, Jackson, Douglas, Josephine, and Curry in Oregon, and Humbolt, Mendocino, Trinity, Glenn, and Del Norte in California.

STATUS OF THE SPECIES UNDER THE ENVIRONMENTAL BASELINE

In order to describe a species' status, it is first necessary to define precisely what "species" means in this context. Traditionally, one thinks of the ESA listing process as pertaining to entire taxonomic species of animals or plants. While this is generally true, the ESA also recognizes that there are times when the listing unit must necessarily be a subset of the species as a whole. In these instances, the ESA allows a "distinct population segment" (DPS) of a species to be listed as threatened or endangered.

NMFS developed the approach for defining salmonid DPSs in 1991 (Waples, 1991). Waples' paper states that a population or group of populations is considered distinct if they are "substantially reproductively isolated from conspecific populations," and if they are considered "an important component of the evolutionary legacy of the species." A distinct population or group populations is referred to as an ESU of the species. Both of the ESUs addressed in this Opinion are considered DPSs and hence "species" under the ESA.

The threatened salmon identified in the section above were listed under the ESA because NMFS determined that a number of factors—both environmental and demographic—had caused them to decline to the point where they were likely to be in danger of going extinct within the foreseeable future. The factors for decline affect salmonid biological requirements at every life stage and arise from a number of different sources. This section of the Opinion explores those effects and defines the context within which they take place.

Species/ESU Life Histories

Coho Salmon

In contrast to the life history patterns of other anadromous salmonids, coho salmon generally exhibit a relatively short and fixed 3-year life cycle. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas for up to 15 months throughout the range of the ESU. Parr undergo a smolt transformation typically in their second spring at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific Ocean prior to returning to spawn in their natal streams. Adults typically begin their spawning migration in the late summer and fall, spawn by midwinter, then die. Coho salmon typically spend two growing seasons in the ocean before returning to their natal stream to spawn as 3-year-olds. Some precocious males, or "jacks," return to spawn after only six months at sea (i.e., as 2-year-olds).

The life histories of OC coho and SONCC coho are similar enough that there is no need to differentiate between them for the purposes of this Opinion. For more information on coho salmon life histories and biology, please see Weitkamp et al. (1995) and NMFS (1997a).

Overview Status of the Species in the Action Area

To determine a species' status under extant conditions (usually termed "the environmental baseline"), it is necessary to ascertain the degree to which the species' biological requirements are being met at the time of the proposed action and in that action area. For the purposes of this consultation, the biological requirements of these threatened ESUs are expressed in two ways: population parameters such as fish numbers, distribution, and trends through-out the action area; and the condition of various essential habitat features such as water quality, substrate condition, and food availability. Clearly, these two types of information are interrelated; the condition of a given habitat has a great deal of impact on the number of fish it can support. Nonetheless, it is useful to separate the species' biological requirements into these parameters because doing so is a good way to get a full picture of all the factors affecting the survival of listed fish and their response to those factors. Therefore, the discussion to follow will be divided into two parts: (1) Species Distribution and Trends and (2) Factors Affecting the Environmental Baseline.

Species Distribution and Trends

OC Coho Salmon

Based on historic commercial landing numbers and estimated exploitation rates, coho salmon escapement to coastal Oregon rivers was estimated to fall between one and 1.4 million fish in the early 1900s, and the harvest level at that time was nearly 400,000 fish (Mullen, 1981; Lichatowich, 1989). Recent (1996-2000) spawning escapement estimates using stratified random surveys give an annual average of 47,356 returning adults (Jacobs et al., 2002). Lichatowich (1989) attributed this decline to a nearly 50% reduction in habitat production capacity. Current production potential for coho salmon in coastal Oregon rivers has been estimated at about 800,000 fish using stock-recruit models (Lichatowich, 1989). While the contrasting methods of estimating total returns make it difficult to compare historical and recent escapements, these numbers suggest that current abundance of coho salmon on the Oregon coast may be less than 5% of that in the early part of this century. The ODFW (1995) made estimates of coho salmon abundance at several points of time from 1900 to the present. These data show a decline of about 75% from 1900 to the 1950s and an additional 15% decline (to a total of about 90%) since the 1950s. However, though the overall trend has been distinctly downward throughout the century, it should be noted that OC coho populations are highly variable from year to year. From 1990 to 2000, OC coho abundance ranged from lows of 15,510 and 14,068 in 1990 and 1997, respectively, to highs of 59,453 and 52,678 in 1996 and 2000, respectively (Jacobs et al., 2002). In the year 2001, those number took a dramatic upswing to an estimated 149,058—the highest number in decades (ODFW, 2002b). In general the trend over the course of the decade was an increasing one from very low numbers 1990 to a decadal high in 1996, a crash in 1997, and another increase until the big jump in 2001.

Recent adult data for this ESU are summarized in NMFS' draft report titled Preliminary Conclusions Regarding the Updated Status of Listed ESUs of West Coast Salmon and Steelhead

NMFS, 2003a). Total average (5-year geometric mean) spawner abundance for this ESU in 1996 was estimated at about 52,000. The Oregon Department of Fish and Wildlife (ODFW) published a report on the status of Oregon coastal stocks of anadromous salmonids, 2000-2001 and 2001-2002 (Jacobs, et al., 2002). Annual estimates of wild coho spawner abundance in coastal river basins within the OC coho salmon ESU for the period 1990-2001 varied widely but show an increasing trend for the last five years. ODFW field staff conducting spawning ground counts and juvenile outmigration estimates report larger than expected run sizes for both adult and juvenile coho salmon (M. Solazzi, ODFW, personal communication, January 2003, March 2003). Preliminary adult OC coho salmon abundance for the 2002 spawning season was estimated by ODFW at 238,713 (ODFW, 2002b). Incorporating this new, though preliminary, information adjusts the 5-year average spawner abundance for this ESU to about 92,000.

While we currently lack actual data on naturally-produced juvenile coho salmon production for this ESU, it is possible to make rough estimates of juvenile abundance from adult return data. Sandercock (1991) published fecundity estimates for several coho salmon stocks; average fecundity ranged from 1,983 to 5,000 eggs per female. By applying a conservative 2,000 eggs per female value to the estimated 46,000 females returning (roughly half of 92,000) to this ESU, approximately 92 million eggs may be expected to be produced annually. Published estimates of survival from egg to smolt are few and variable but have been estimated to average around 10% (Healey, 1991). Thus, we can make a rough estimate of nine million juvenile coho salmon in the Oregon Coast ESU.

SONCC Coho Salmon

The three major river systems supporting coho in the SONCC ESU are the Rogue, Klamath (including the Trinity), and Eel Rivers. The Rogue River is the major river basin in the action area and it accounts for the majority of coho salmon production in the Oregon portion of the SONCC ESU. Of the 396 streams within the range of the California portion of the SONCC ESU that were identified as once having had coho salmon runs, recent survey information is available for 115 streams. Of these 115 streams, 73 still support coho salmon runs. The rivers and tributaries in the California portion of the SONCC ESU were recently estimated to have average total run sizes of 7,080 natural spawners and 17,156 hatchery returns. According to Brown et al. (1994), 4,480 were identified as native fish occurring in tributaries having little history of supplementation with non-native fish. South of Cape Blanco, Nehlsen et al. (1991) considered all but one coho salmon stock to be at "high risk of extinction." Nickelson et al. (1992a) rated all Oregon coho salmon stocks south of Cape Blanco as "depressed." Counts of adult coho salmon over Gold Ray Dam (Upper Rogue River) provide a historic view of this species' abundance. During the 1940s, counts averaged 2,000 adult coho salmon per year. Between the late 1960s and early 1970s, adult counts averaged fewer than 200. During the late 1970s, dam counts increased, corresponding with returning coho salmon produced at Cole Rivers Hatchery. Coho salmon run size estimates derived from seine surveys at Huntley Park near the mouth of the Rogue River ranged from 450 to 19,200 naturally-produced adults between 1979 and 1991. Recent estimates of naturally-produced adults returning to the Rogue River have been highly

variable over the past five years. Though the annual river run sizes from 1997 to 2001 have averaged 7,043 natural fish, the range of the returns over that period runs from around 1,400 to more than 12,000 (ODFW, 2002a). Five year average adult abundance is approximately 7,000 fish.

While we currently lack actual data on naturally-produced juvenile coho salmon production for this ESU, it is possible to make rough estimates of juvenile abundance from adult return data. Sandercock (1991) published fecundity estimates for several coho salmon stocks; average fecundity ranged from 1,983 to 5,000 eggs per female. By applying a conservative 2,000 eggs per female value to the estimated 3,500 females returning (roughly half of 7,000) to this ESU, approximately seven million eggs may be expected to be produced annually. Published estimates of survival from egg to smolt are few and variable but have been estimated to average around 10% (Healey, 1991). Thus, we can make a rough estimate of 700,000 juvenile coho salmon in this ESU.

Summary

The degree to which OC and SONCC coho salmon's biological requirements are being met in the action area with respect to population numbers and distribution has not improved substantially since the time of listing. Though they have consistently exhibited very low numbers compared to historic levels, it appears that recent trends are increasing ones, though relatively highly variable. However, their habitat (critical and otherwise) has shown a steady decrease in area and function since the turn of the 20th century and that trend continues. Therefore, while there is some cause for optimism, there has been no genuine change in the species' status since they were listed, and the most likely scenario is that their biological requirements are not being met with respect to abundance, distribution, and overall trend.

Factors Affecting the Environmental Baseline

Environmental baselines for biological opinions are defined by regulation at 50 CFR 402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for this biological opinion is therefore the result of the impacts that many activities have had on the threatened ESUs' survival and recovery. Put another way (and as touched upon previously) the baseline is the culmination of these effects that multiple activities have had on these species' biological requirements and, by examining those individual effects, it is possible to derive the species' status in the action area.

Many of the biological requirements for threatened OC coho salmon and threatened SONCC coho salmon in the action area can best be expressed in terms of essential habitat features. That is, as described in NMFS (2000a), the salmon require adequate:

- substrate (especially spawning gravel)
- water quality
- water quantity
- water temperature
- water velocity
- cover/shelter
- food
- riparian vegetation
- space
- migration conditions

The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. These factors are well known and documented in dozens—if not hundreds—of scientific papers, policy documents, news articles, books, and other media. It is therefore unnecessary to illustrate in this opinion the many ways in which human activities and natural factors have affected the threatened ESUs' habitat-related biological requirements; thus the following paragraphs constitute a brief summary of what the most recent accepted science has to say about how human action and natural processes have degraded essential habitat features in the affected subbasins.

Some factors in the action area (e.g., hydropower and agricultural development) have had adverse effects on every single one of the habitat-related biological requirements listed above, while other factors have only affected some of those essential habitat features. For example, road building in the subbasins has had a sizeable effect on stream substrates and water quality (through siltation), and road culverts have blocked fish passage, but such activities have not had much of an effect on water velocity. Timber harvest and grazing activities have affected—to greater or lesser degrees—all the factors except space. Further, mining has affected most of the factors—but primarily water quality. And urban development has affected them all, and is a factor for these somewhat urban and suburban subbasins. In short, nearly every widespread human activity in the basin has adversely affected some or all of habitat features listed above. And by disrupting those habitat features, these activities—coupled with hatchery and harvest effects and occasional natural disturbances such as drought and fire—have had detrimental impacts on the ESUs' health, physiology, numbers, and distribution in every subpopulation and at every life stage. For detailed information on how various factors have degraded essential habitat features, see any of the following: NMFS (1991), Nehlsen (1991), NMFS (1997b), NMFS (1998), NMFS (2000a), NMFS (2001).

Listed fish and other fish in the coastal waters of Oregon are the subject of scientific research and monitoring actions. Most biological opinions issued by NMFS have conditions requiring specific monitoring, evaluation, and research projects to gather information to aid the survival of

listed fish. Recently, NMFS issued numerous research permits/authorizations allowing take of threatened OC coho salmon and threatened SONCC coho salmon (NMFS, 2002, 2003b) which are summarized in Table 2.

Table 2. Total Authorized Take for Scientific Research Actions in 2003.

	OC Coho Salmon				SONCC Coho Salmon			
	Adult		Juvenile		Adult		Juvenile	
	Non-Lethal	Lethal	Non-Lethal	Lethal	Non-Lethal	Lethal	Non-Lethal	Lethal
Section 10 Research	2	0	2,235	255	1,602	10	1,556	37
4(d) Research	22,661	197	794,667	11,474	1,041	32	109,213	1,047
TOTAL	22,663	197	796,902	11,729	2,643	42	110,769	1,084

Each authorization for take by itself would not lead to decline of the species. However the sum of the authorized takes indicate a high level of research effort in the action area. The effect of these activities is difficult to assess because, despite the fact that fish are harassed and sometimes even killed in the course of scientific research, these activities have a great potential to benefit to listed species. For example, aside from simply increasing what is known about the listed species and their biological requirements, research is essentially the only way to answer key questions associated with difficult resource issues that crop up in every management arena and involve every salmonid life history stage (particularly the resource issues discussed in the previous sections). Most importantly, the information gained during research and monitoring activities will help resource managers plan for the recovery of listed species. Further, there is no way to tell if the corrective measures described in the previous sections are working unless they are monitored, and there is no way to design new and better approaches if research is not done.

The picture of whether threatened OC coho salmon and threatened SONCC coho salmon's biological requirements are being met is more clear-cut for habitat-related parameters than for population factors: given all the factors for decline—even taking into account the corrective measures being implemented[1]—it is clear that their biological requirements are currently not being met under the environmental baseline. Their status' are such that there must be a significant improvement in the environmental conditions of the species' respective habitats (over those currently available under the environmental baselines). Any further degradation of the environmental conditions could have a large impact because the species' are already at risk. In addition, there must be efforts to minimize impacts caused by dams, harvest, hatchery

[1] See the following documents for a summary of conservation efforts: Steelhead Conservation Efforts: A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act, August 1996; Coastal Salmon Conservation Working Guidance for Comprehensive Salmon Restoration Initiatives on the Pacific Coast, September 15, 1996; NOAA Technical Memorandum NMFS-NWFSC-42, June 2000, Viable Salmon Populations and the Recovery of Evolutionarily Significant Units.

operations, habitat degradation, and unfavorable natural conditions.

EFFECTS OF THE ACTION

The purpose of this section is to identify what effects NMFS' issuance of scientific research permits will have on the threatened ESUs that are the subject of this Opinion. To the extent possible, this will include analyses of effects at the population level. Where information on the ESUs is lacking at the population level, this analysis assumes that the status of each affected population is the same as the ESU as a whole. The method NMFS uses for evaluating effects is discussed first, followed by discussions of the general effects scientific research activities are known to have and permit-specific effects.

Evaluating the Effects of the Action

Over the course of the last decade and hundreds of ESA section 7 consultations, NMFS developed the following four-step approach for applying the ESA Section 7(a)(2) standards when determining what effect a proposed action is likely to have on a given listed species. What follows here is a summary of that approach:

1. Define the biological requirements and current status of each listed species.

2. Evaluate the relevance of the environmental baseline to the species' current status.

3. Determine the effects of the proposed or continuing action on listed species and their habitat.

4. Determine whether the species can be expected to survive with an adequate potential for recovery under (a) the effects of the proposed (or continuing) action, (b) the effects of the environmental baseline, and (c) any cumulative effects—including all measures being taken to improve salmonid survival and recovery.

The fourth step above requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (i.e., impacts on essential habitat features). The second part focuses on the species itself. It describes the action's impact on individual fish—or populations, or both—and places that impact in the context of the ESU as a whole. Ultimately, the analysis seeks to answer the questions of whether the proposed action is likely to jeopardize a listed species' continued existence or destroy or adversely modify its designated critical habitat (if any exists) (NMFS, 1999).

Effects on Habitat

Previous sections have detailed the scope of the habitat in the action area, described the essential

features of that habitat, and depicted its present condition. The discussion here focuses on how those features are likely to be affected by the proposed actions.

Full descriptions of the proposed activities are found in the next section. In general, the activities will be: (a) electrofishing using backpack equipment, (b) capturing fish with nets of various types, and (c) handling or intentionally killing captured fish. All of these techniques are minimally intrusive in terms of their effect on habitat. None of them will measurably affect any of the 10 essential fish habitat features listed earlier (i.e., stream substrates, water quality, water quantity, food, streamside vegetation, etc.). Moreover, the proposed activities are all of short duration. Therefore, NMFS concludes that the proposed activities are unlikely to have an adverse impact on habitat, and thus will not jeopardize the fish by reducing the ability of that habitat to contribute to their survival and recovery.

Effects on OC Coho Salmon and SONCC Coho Salmon

The primary effects the proposed activities will have on the threatened ESUs will be in the form of intentional "take" (the ESA take definition is given in the section introducing the individual permits), a major portion of which takes the form of harassment. Harassment generally leads to stress and other sub-lethal effects and is caused by observing, capturing, and handling fish. The ESA does not define harassment nor has NMFS defined this term through regulation. However, the USFWS defines harassment as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding or sheltering" [50 CFR 17.4]. For the purposes of this analysis, NMFS adopts this definition of harassment.

As Table 1 illustrates, the various proposed activities would cause many types of take, and while there is some uncertainty between what constitutes an activity (e.g., electrofishing) and what constitutes a take category (e.g., harm), it is important to keep the two concepts separate. The reason for this is that the effects being measured here are those which the activity itself has on the listed species. They may be expressed in terms of the take categories (e.g., how many salmon are harmed, or harassed, or even killed), but the actual mechanisms of the effects themselves (i.e., the activities) are the causes of whatever take arises and, as such, they bear examination. Therefore, the first part of this section is devoted to a discussion of the general effects known to be caused by the proposed activities—regardless of where they occur or what species are involved.

The following subsections describe the types of activities being proposed. Because they would all be carried out by trained professionals using established protocols and have widely recognized specific impacts, each description is described in terms broad enough to apply to every proposed permit. This is especially true in light of the fact that the researchers would not receive a permit unless their activities (e.g., electrofishing) incorporate NMFS' uniform, pre-

established set of mitigation measures. These measures are described previously in this Opinion. They are incorporated (where relevant) into every permit as part of the terms and conditions to which a researcher must adhere.

Observation

For some studies, listed fish will be observed in-water. Direct observation is the least disruptive and simplest method for determining presence/absence of the species. Its effects are also generally the shortest-lived among any of the research activities discussed in this section. Fry and juveniles frightened by the turbulence and sound created by observers are likely to seek temporary refuge behind rocks, vegetation, and deep water areas. In extreme cases, some individuals may temporarily leave a particular pool or habitat type when observers are in their area. Researchers minimize the amount of disturbance by moving through streams slowly thus allowing ample time for fish to reach escape cover; though it should be noted that the research may at times involve observing adult fish—which are more sensitive to disturbance. Harassment is the primary form of take associated with these observation activities, and few if any injuries or deaths are expected to occur—particularly in cases where the observation is to be conducted solely by researchers on the stream banks rather than in the water. There is little a researcher can do to mitigate the effects associated with observation activities because those effects are so minimal. In general, all they can do is move with care and attempt to avoid disturbing sediments, gravels, and, to the extent possible, the fish themselves.

Capture/handling

Capturing and handling fish causes them stress—though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death from handling are excessive doses of anesthetic, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis. To minimize these effects NMFS adds terms and conditions to every permit.

Based on prior experience with the research techniques and protocols that would be used to conduct the proposed scientific research, no more than five percent of the juvenile salmonids encountered are likely to be killed as an unintentional result of being captured and handled and, in most cases, that figure will not exceed three percent. In addition, it is not expected that more than three percent of the adults being handled will die. In any case, all researchers will employ the mitigation measures described earlier and thereby keep adverse effects to a minimum. Finally, any fish unintentionally killed by the research activities in the proposed permits may be retained as reference specimens or used for other research purposes.

Electrofishing

Electrofishing is a process by which an electrical current is passed through water containing fish in order to stun them—thus making them easy to capture. It can cause a suite of effects ranging from simple harassment to actually killing the fish. The amount of unintentional mortality attributable to electrofishing may vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician. Electrofishing can have severe effects on adult salmonids. Spinal injuries in adult salmonids from forced muscle contraction have been documented. Sharber and Carothers (1988) reported that electrofishing killed 50 percent of the adult rainbow trout in their study. The long-term effects electrofishing has on both juveniles and adult salmonids are not well understood, but long experience with electrofishing indicates that most impacts occur at the time of sampling and are of relatively short duration.

The effects electrofishing may have on the threatened ESUs would be limited to the direct and indirect effects of exposure to an electric field, capture by netting, holding captured fish in aerated tanks, and the effects of handling associated with transferring the fish back to the river (see the previous subsection for more detail on capturing and handling effects). Most of the studies on the effects of electrofishing on fish have been conducted on adult fish greater than 300 mm in length (Dalbey et al., 1996). The relatively few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish. Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers, 1988) and may therefore be subject to lower injury rates (e.g., Hollender and Carline, 1994; Dalbey et al., 1996; Thompson et al., 1997). McMichael et al. (1998) found a 5.1% injury rate for juvenile Middle Columbia River steelhead captured by electrofishing in the Yakima River subbasin. The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers, 1988; McMichael, 1993; Dalbey et al., 1996; Dwyer and White, 1997). Continuous direct current (DC) or low-frequency ($\leq$30 Hz) pulsed DC have been recommended for electrofishing (Fredenberg, 1992; Snyder, 1992, 1995; Dalbey et al., 1996) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg, 1992; McMichael, 1993; Sharber et al., 1994; Dalbey et al., 1996). Only a few recent studies have examined the long-term effects of electrofishing on salmonid survival and growth (Dalbey et al., 1996; Ainslie et al., 1998). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes they show no growth at all (Dalbey et al., 1996).

NMFS' electrofishing guidelines (NMFS, 2000b) will be followed in all surveys using this procedure. The guidelines require that field crews be trained in observing animals for signs of stress and shown how to adjust electrofishing equipment to minimize that stress. Electrofishing is used only when other survey methods are not feasible. All areas for stream and special needs surveys are visually searched for fish before electrofishing may begin. Electrofishing is not done in the vicinity of redds or spawning adults. All electrofishing equipment operators are trained by qualified personnel to be familiar with equipment handling, settings, maintenance, and safety. Operators work in pairs to increase both the number of fish that may be seen and the ability to

identify individual fish without having to net them. Working in pairs also allows the researcher to net fish before they are subjected to higher electrical fields. Only DC units will be used, and the equipment will be regularly maintained to ensure proper operating condition. Voltage, pulse width, and rate will be kept at minimal levels and water conductivity will be tested at the start of every electrofishing session so those minimal levels can be determined. Due to the low settings used, shocked fish normally revive instantaneously. Fish requiring revivification will receive immediate, adequate care.

Intentional Mortality/Sacrifice

In some instances, it is necessary to kill a captured fish in order to gather whatever data a study is designed to produce. In such cases, determining effect is a very straightforward process: the sacrificed fish, if juveniles, are forever removed from the ESU's gene pool; if the fish are adults, the effect depends upon whether they are killed before or after they have spawned. If they are killed after they spawn, there is very little overall effect. Essentially, it amounts to removing the nutrients their bodies would have provided to the spawning grounds. If they are killed before they spawn, not only are they removed from the ESU, but so are all their potential progeny. Thus, killing pre-spawning adults has the greatest potential to affect their ESU and because of this, NMFS rarely allows it to happen. If it does—it does so in very low numbers. Also the adults are stripped of sperm and eggs so their progeny can be raised in a controlled environment such as a hatchery—thereby greatly decreasing the potential harm posed by sacrificing the adults.

Benefits of Research

Under section 10(d) of the ESA, NMFS is prohibited from issuing a section 10(a)(1)(A) permit unless NMFS finds that the permit (1) was applied for in good faith; (2) if granted and exercised, will not operate to the disadvantage of the endangered and/or threatened species that is/are the subject of the permit; and (3) is consistent with the purposes and policy of section 2 of the ESA. In addition, NMFS does not issue a section 10(a)(1)(A) permit unless the proposed activities are likely to result in a net benefit to the listed species that is/are the subject of the permit; benefits accrue from the acquisition of scientific information.

For more than a decade, research and monitoring activities conducted with anadromous salmonids in the Pacific Northwest have provided resource managers with a wealth of important and useful information on anadromous fish populations. For example, juvenile fish trapping efforts have enabled the production of population inventories, PIT-tagging efforts have increased the knowledge of anadromous fish migration timing and survival, and fish passage studies have provided an enhanced understanding of fish behavior and survival when moving past dams and through reservoirs. By issuing section 10(a)(1)(A) scientific research permits, NMFS will cause information to be acquired that will enhance the ability of resource managers to make more effective and responsible decisions to sustain anadromous salmonid populations that are at risk of extinction, to mitigate impacts to endangered and threatened salmon and steelhead, and to

implement recovery efforts. The resulting data will improve the knowledge of the respective species' life history, specific biological requirements, genetic make-up, migration timing, responses to anthropogenic impacts, and survival in the river system.

Permit-specific Effects

In addition to the effects discussed above, each permit's proposed activities may have additional adverse effects that need to be analyzed. Researchers will use measures required through the permit conditions discussed previously to mitigate such adverse impacts on listed ESUs.

In the "Status of the Species" section both juvenile and adult population abundance is discussed. In the following section NMFS analyzes the impacts of the take numbers in the context of those numbers.

Permit 1140
Permit 1140 would authorize the NWFSC to intentionally kill no more than 400 juvenile OC coho salmon. Sampling activities will occur in nearshore areas in Oregon.

This research will take place in the marine environment thus it is impossible to determine the exact origin of the affected fish. To determine the effects the research may have, take numbers were placed in the context of expected juvenile outmigration for the entire ESU. NMFS estimates an outmigration of approximately nine million juvenile OC coho salmon for the entire ESU. If these coho salmon outmigrations are typical for future years, the annual loss of up to 400 juvenile OC coho salmon associated with the NWFSC's research will not have a measurable impact on either of the juvenile populations nor on the ESU's status.

Though the negative effects of the research are very low, the researchers will take the following steps to reduce them even further: unintentional mortalities are reduced or eliminated by safe sampling and handling methods such as carefully guiding fish into seines, keeping seines fully submerged, and immediately releasing non-targeted fish. Additionally, researchers make every effort to coordinate fishing efforts with other researchers in the area to minimize effects on salmonids and their environment. Given these measures, the already stated Permit Conditions, and the need for information on estuaries for use in management and restoration plans, the small losses to be incurred are discountable.

Permit 1205
Permit 1205 would authorize the ODEQ to handle 1,080 and unintentionally kill 54 juvenile SONCC coho salmon. Sampling activities would occur selected streams in Southwestern Oregon.

To determine the effects this research would have it is necessary to place the take numbers in the

contexts of expected juvenile outmigration. It is necessary to use the entire outmigration (rather than a more geographically limited set) because the research will take place in randomly selected areas each year thus it is impossible to determine the origin of affected fish within the ESU. NMFS estimates an outmigration of approximately 700,000 juvenile SONCC coho salmon. If this outmigration is typical for future years, the annual loss of up to 54 juvenile SONCC coho salmon associated with ODEQ's research will not have a measurable impact on either the juvenile population nor on the status of the ESU.

Though the negative effects of the research are very low, the researchers will take the following steps to reduce them even further: sampling will be conducted quickly for qualitative rather than quantitative fish population census. Fish will be held in oxygenated water and processed quickly to minimize stress. Given these measures, the already stated Permit Conditions, and the need for information on the status and trends of the chemical, habitat, and biological integrity of streams resources in the area, the small losses to be incurred are discountable.

Permit 1335 - modification 2

Modification 2 to Permit 1335 would authorize the USFS to increase the number of fish captured, handled, and released by up to 500 juvenile OC coho salmon and 500 juvenile SONCC coho salmon. The permit would also allow the USFS to kill up to 10 more juvenile OC coho salmon and 15 more juvenile SONCC coho salmon as an indirect result of being captured. Sampling activities will occur in stream systems in the Columbia and Oregon Coastal basins.

Because the researchers will be operating in randomly chosen sites throughout the OC and SONCC ESUs, the context for determining effect is the entire outmigration. NMFS estimates an outmigration of approximately nine million juvenile OC coho and 700,000 juvenile SONCC coho salmon. If these outmigrations are typical for future years, the annual loss of up to 10 more juvenile OC coho salmon and 15 more juvenile SONCC coho salmon associated with the USFS' research (unintentional mortalities due to handling) will not have a measurable impact on either of the juvenile populations nor the ESU's status. Even so, the researchers will try to get it as close to zero as possible. They will not do any electrofishing in areas with salmonid eggs or alevin, they will avoid all adult salmonids, and they will coordinate with state fish and game agencies whenever possible to avoid duplicate sampling. Given these measures, the small numbers of take, the already stated Permit Conditions, and the need to monitor Federal land use actions and their effects on aquatic habitats, the negative effects of the research may be entirely discounted.

Permit 1410

Permit 1410 would authorize the NWFSC to capture, handle, and release up to 40 adult OC coho salmon and four adult SONCC coho salmon. In addition, the permit would allow the NWFSC to intentionally kill up to 150 juvenile OC coho salmon and 15 juvenile SONCC coho salmon. The permit would also allow the NWFSC to kill up to one adult OC coho salmon as an indirect result of being captured. Sampling activities will occur in the Columbia River plume and surrounding

ocean environment.

This research will take place in the Columbia River plume and surrounding ocean environment thus it is impossible to determine the exact origin of the affected fish. To determine the effects the research may have, take numbers were placed in the context of expected juvenile outmigration and adult abundance for the entire ESU. NMFS estimates an outmigration of approximately nine million juvenile OC coho and 700,000 juvenile SONCC coho salmon. If these outmigrations are typical for future years, the annual loss of up to 150 juvenile OC coho salmon and 15 juvenile SONCC coho salmon associated with the NWFSC's research will not have a measurable impact on any of the juvenile populations nor the status' of the ESUs. NMFS estimates the recent abundance of adult OC coho salmon at 92,000. If the next five years are anything like the last five years, the annual loss of up to one adult OC coho salmon associated with the NWFSC's research (which would be an indirect mortality due to handling) will not have a measurable impact on the adult population nor the status of the ESU.

Though there are negative effects associated with killing adult listed fish, the number of listed adults killed (one fish) represents such a small fraction of the ESU as a whole, the effect is negligible. One should also consider the fact that a great deal of information will be taken from the dead fish and used (eventually) to develop a set of hydropower management scenarios to benefit salmonid survival, growth, and health.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions (not involving Federal activities) that are reasonably certain to occur within the action area subject to this consultation. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act.

State, tribal, and local government actions will likely be in the form of legislation, administrative rules or policy initiatives. Government and private actions may include changes in land and water uses—including ownership and intensity—any of which could impact listed species or their habitat. Government actions are subject to political, legislative, and fiscal uncertainties. These realities, added to geographic scope of the action area which encompasses numerous government entities exercising various authorities and the many private landholdings, make any analysis of cumulative effects difficult and speculative. For more information on the various efforts being made a the local, tribal, state, and national levels see NMFS' Biological Opinion on the Issuance and Funding of Eight Section 10(a)(1)(A) Permits, Permit Modifications, and Permit Amendments for Take of Threatened Oregon Coast Coho Salmon and Southern Oregon/ Northern California Coasts Coho Salmon for Scientific Research and Enhancement Purposes (NMFS, 2002) and NMFS' Reinitiation of Consultation on Operation of the Federal Columbia River Power System Including the Juvenile Transportation Program and 19 Bureau of

Reclamation Projects in the Columbia Basin (NMFS, 2001).

Non-federal actions are likely to continue affecting listed species. The cumulative effects in the action area are difficult to analyze because of the Opinion's large geographic scope, the different resource authorities in the action area, the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, based on the trends identified in the baseline, the adverse cumulative effects are likely to increase. Although state, tribal and local governments have developed plans and initiatives to benefit listed fish, they must be applied and sustained in a comprehensive way before NMFS can consider them "reasonably foreseeable" in its analysis of cumulative effects.

Integration and Synthesis of Effects

OC coho salmon

A majority (approximately 51%) of the OC coho salmon that will be captured, handled, observed, etc., during the course of the proposed research (a total of 1,060 juvenile and 41 adult fish) are expected to die as a result of these research actions. One adult fish may be killed as an indirect result of the research. Even though so many of the captured fish are expected to die, they represent a small percentage of the total juvenile OC coho salmon outmigration. A maximum of 0.01% of the total juvenile OC coho salmon outmigration will be affected and a maximum of 0.04% of the total adult OC coho salmon escapement will be affected in even the slightest way. Thus it is likely that no adverse effects will result from these actions at either the population or the ESU level. Table 3 summarizes these effects for each permit.

Table 3. Maximum Annual Take of Threatened OC coho salmon

	Adult				Juvenile			
	Handle		Mortality		Handle		Mortality	
PERMIT Action	C,H,R	C,T/M,S,R	INTENTIONAL	UNINTENTIONAL	C,H,R	C,T/M,S,R	INTENTIONAL	UNINTENTIONAL
1140	0	0	0	0	0	0	400	0
1335 M2	0	0	0	0	500	0	0	10
1410	40	0	0	1	0	0	150	0
TOTALS	40	0	0	1	500	0	550	10

C,H,R = capture,handle,release, C,T/M,S,R = capture, tag/mark, sample, release

If the total amount of estimated juvenile lethal take for all research activities—560 juvenile OC coho salmon—is expressed as a fraction of the nine million smolts expected to outmigrate, it represents a loss of 0.006% of the run. However, and for a number of reasons, that number is probably much smaller. First, it is important to remember to account for potential accidental deaths, that every estimate of unintentional lethal take for the proposed studies has purposefully been inflated and it is therefore very likely that fewer than 560 juveniles will be killed by the

research. Second, some of the studies will specifically affect OC coho salmon in the smolt stage, but others will not. These latter studies are described as affecting "juveniles," which means they may target OC coho salmon yearlings, parr, or even fry life stages represented by many more individuals than reach the smolt stage—perhaps as much as an order of magnitude more. Therefore the 0.006% figure was derived by overestimating the number of fish likely to be killed, and treating each dead OC coho salmon as a smolt when some of them may not be. Thus the actual number of OC coho salmon the research is likely to kill is undoubtedly smaller than 0.006%.

Even if the entire 0.006% of the juvenile OC coho salmon population were killed, and they were all treated as smolts, it would be very difficult to translate that number into an actual effect on the species. And this effect is even smaller when compared to the loss of an adult in terms of species survival and recovery. This is due to the fact that a great many smolts die before they can mature into adults. Approximately 0.001% of the adult OC coho salmon are proposed to be unintentionally killed. It is also difficult to translate the loss of one adult fish into an actual effect on the species. The research is proposed to be conducted in the Columbia River plume and surrounding ocean environment and although there is a good chance that adult fish in this area will make it to the spawning grounds and successfully spawn, it is hard to determine an adverse effect.

Nonetheless, regardless of its magnitude, that negative effect must be juxtaposed with the benefits to be derived from the research (see descriptions of the individual permits). Those benefits range from finding ways to identify and quantify factors limiting survival of juvenile salmon (Permit 1410) to supporting enforcement of the Clean Water Act (Permit 1205). In all, the fish will derive some benefit from every permit considered in this Opinion. The amount of benefit will vary, but in some cases it may be significant. For the purpose of section 7(a)(2) NMFS must consider the adverse effects when deciding whether the contemplated actions will appreciably reduce the likelihood of the OC coho salmon's survival and recovery in the wild—the critical determination in issuing any biological opinion.

SONCC coho salmon

The vast majority (approximately 95%) of the SONCC coho salmon that will be captured, handled, observed, etc., during the course of the proposed research (a total of 1,664 juvenile and four adult fish) are expected to survive with no long-term effects. Moreover, most capture, handling, and holding methods will be minimally intrusive and of short duration. Because so many of the captured fish are expected to survive the research actions and so few (a maximum of 0.24% of the total juvenile SONCC coho salmon outmigration and a maximum of 0.06% of the total adult SONCC coho salmon escapement) will be affected in even the slightest way, it is likely that no adverse effects will result from these actions at either the population or the ESU level. Therefore, adverse effects must be expressed in terms of the individual fish that may be killed during the various permitted activities. Table 4 summarizes these effects for each permit.

Table 4. Maximum Annual Take of Threatened SONCC coho salmon

	Adult				Juvenile			
	Handle		Mortality		Handle		Mortality	
PERMIT Action	C,H,R	C,T/M,S,R	INTENTIONAL	UNINTENTIONAL	C,H,R	C,T/M,S,R	INTENTIONAL	UNINTENTIONAL
1205	0	0	0	0	1,080	0	0	54
1335 M2	0	0	0	0	500	0	0	15
1410	4	0	0	0	0	0	15	0
TOTALS	4	0	0	0	1,580	0	15	69

C,H,R = capture,handle,release, C,T/M,S,R = capture, tag/mark, sample, release

If the total amount of estimated lethal take for all research activities—84 juvenile SONCC coho salmon—is expressed as a fraction of the 700,000 fish expected to outmigrate, it represents a loss of 0.012% of the run. However, and for a number of reasons, that number is probably much smaller. First, it is important to remember to account for potential accidental deaths, that every estimate of lethal take for the proposed studies has purposefully been inflated and it is therefore very likely that fewer than 84 juveniles will be killed by the research. Second, some of the studies will specifically affect SONCC coho salmon in the smolt stage, but others will not. These latter studies are described as affecting "juveniles," which means they may target SONCC coho salmon yearlings, parr, or even fry life stages represented by many more individuals than reach the smolt stage—perhaps as much as an order of magnitude more. Therefore the 0.012% figure was derived by overestimating the number of fish likely to be killed, and treating each dead SONCC coho salmon as a smolt when some of them clearly won't be. Thus the actual number of SONCC coho salmon the research is likely to kill is undoubtedly smaller than 0.012%—perhaps as little as half (or less) of that figure.

Even if the entire 0.012% of the juvenile SONCC coho salmon population were killed, and they were all treated as smolts, it would be very difficult to translate that number into an actual effect on the species. Even if the subject were one adult killed out of a population of one thousand it would be hard to resolve an adverse effect. And in this instance, that effect is even smaller because the loss of a smolt is not equivalent to the loss of an adult in terms of species survival and recovery. This is due to the fact that a great many smolts die before they can mature into adults. Nonetheless, regardless of its magnitude, that negative effect must be juxtaposed with the benefits to be derived from the research (see descriptions of the individual permits). Those benefits range from finding ways to identify and quantify factors limiting survival of juvenile salmon (Permit 1410) to supporting enforcement of the Clean Water Act (Permit 1205). In all, the fish will derive some benefit from every permit considered in this Opinion. The amount of benefit will vary, but in some cases it may be significant. For the purpose of section 7(a)(2) NMFS must consider the adverse effects when deciding whether the contemplated actions will appreciably reduce the likelihood of the SONCC coho salmon's survival and recovery in the wild—the critical determination in issuing any biological opinion.

Conclusion

After reviewing the current status of threatened OC coho salmon and threatened SONCC coho salmon, the environmental baseline for the action area, the effects of the proposed section 10(a)(1)(A) permit actions, and cumulative effects, it is NMFS' biological opinion that issuance of the proposed permits is not likely to jeopardize the continued existence of threatened OC coho salmon and SONCC coho salmon nor destroy nor adversely modify their habitat or designate critical habitat.

Coordination with the National Ocean Service

The activities contemplated in this Biological Opinion will not be conducted in or near a National Marine Sanctuary. Therefore, these activities will not have an adverse effect on any National Marine Sanctuary.

Reinitiation of Consultation

Consultation must be reinitiated if: The amount or extent of annual take specified in the permits and this consultation is exceeded or is expected to be exceeded; new information reveals effects of the actions that may affect the listed species in a way not previously considered; a specific action is modified in a way that causes an effect on the listed species that was not previously considered; or a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

"Essential fish habitat" (EFH) is defined in section 3 of the Magnuson-Stevens Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interprets EFH to include aquatic areas and their associated physical, chemical, and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem. EFH has been designated for Pacific salmon, groundfish, and coastal pelagic species. For information on EFH for these species, please see this website: http://www.nwr.noaa.gov/1habcon/habweb/msa.htm.

The MSA and its implementing regulations at 50 CFR 600.920 require a Federal agency to consult with NMFS before it authorizes, funds, or carries out any action that may adversely affect EFH—in this case, EFH for Pacific salmon, groundfish, and coastal pelagic species. The purpose of consultation is to develop a conservation recommendation(s) that addresses all reasonably foreseeable adverse effects to EFH. Further, the action agency must provide a detailed, written response to NMFS within 30 days of receiving an EFH conservation recommendation. The response must include measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with NMFS' conservation recommendation the agency must explain its reasons for not following the recommendation.

However, in this instance, no conservation recommendations are necessary. As the Biological Opinion above describes, the proposed research actions are not likely, singly or in combination, to adversely affect the habitat upon which Pacific salmon, groundfish, and coastal pelagic species depend. All the actions are of limited duration, minimally intrusive, and are entirely discountable in terms of their effects, short-or long-term, on any habitat parameter important to the fish.

The action agencies must reinitiate EFH consultation if plans for these actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

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